

MBG FOCUS TALK

hosted by Morten Kjeldgaard and Jørgen Kjems



Friday 24 April at 11:15-12:00

The Conference Room (3130-303), 3. floor, Gustav Wieds Vej 10C, Aarhus

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RNA 3D Structure: Beyond Watson-Crick

RNA 2D structure diagrams familiar to molecular biologists show us at a glance how RNA chains fold to form Watson–Crick (WC) paired helices, but they can lead us to think that the nucleotides in the “loops” and the linker segments, which can amount to > 40% of a structured RNA (see diagram), do not significantly interact with other nucleotides. In fact, structured RNAs are compactly folded in 3D as a result of numerous long-range, sequence-specific interactions, many of which involve loop or linker nucleotides, and most of which are non-WC in nature. These interactions structure and stabilize RNA 3D motifs, folds, and architectures.

I will present an easy-to-understand and -use language for recognizing these interactions in 3D structures and representing them on 2D, using *E. coli* 16S ribosomal RNA as a concrete example. This language also helps us to understand the sequence variations we see when we compare the same RNA molecule (for example 16S rRNA) from different organisms and to explore how RNA evolves to allow organisms to adapt to different environments. It allows us to automatically annotate 3D structures with computer programs to facilitate 3D motif searching, comparison, and prediction from sequence.

The picture that emerges from 16S rRNA is that almost all nucleotides in structured RNA molecules, including those in nominally single-stranded loops, form specific interactions that stabilize functional structures or mediate interactions with other molecules. The small number of actually ‘looped-out’ nucleotides make it possible for the RNA chain to form sharp turns. Base-pairing is the most specific interaction in RNA as it involves edge-to-edge hydrogen bonding (H-bonding) of the bases. Non-Watson–Crick base pairs are a significant fraction (> 30%) of base pairs in structured RNAs.

This seminar is a joint MBG/iNano event.